PRESTO Update – NE DOLWG September 2017

Ryan Decker NASA/MSFC Natural Environments Branch/EV44

BJ Barbre Jacobs/EV44

James Brenton Jacobs/EV44

John Orcutt Jacobs/EV44

ryan.k.decker@nasa.gov

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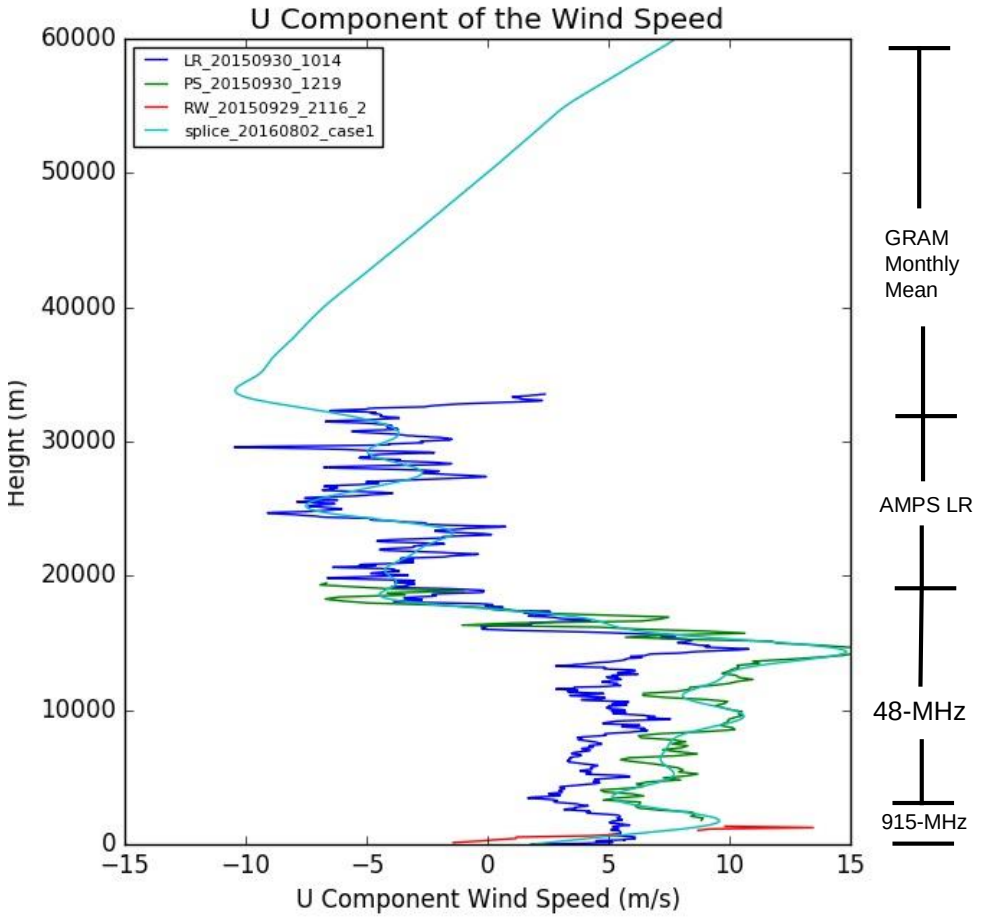
Background

- NASA's Space Launch System (SLS) is using vertically complete atmospheric measurements in vehicle design analyses and day-of-launch (DOL) operations support
  - Designing the vehicle using wind energy spectral content not dependent on instrumentation source
  - Using measured winds as input for DOL I-Load Update (DOLILU) vehicle trajectory and loads assessments
  - Allows for multiple data sources to be used in DOLILU assessments
- The United States Air Force Eastern Range (ER) at Cape Canaveral Air Force Station provides atmospheric data through network of weather balloons and Doppler Radar Wind Profiler (DRWP) instruments
  - Automated Meteorological Profiling Systems (AMPS)
    - Low Resolution Flight Element (LRFE)
    - High Resolution Flight Element (HRFE)
  - Jimsphere
  - Tropospheric DRWP (TDRWP) – NASA owned
  - 915 MHz DRWP
- MSFC Natural Environments (NE) branch has developed software (Profile Envision and Splice Tool (PRESTO)) to produce vertically complete profiles from available sources

ryan.k.decker@nasa.gov

PRESTO Input/Output Example



Spliced Profile Sources:

- Earth Global Reference Atmosphere Model (GRAM) mean monthly winds
- AMPS LRFE
- 48-MHz TDRWP
- 915-MHz DRWP

ryan.k.decker@nasa.gov

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Project Deliverables & Milestones

- PRESTO development requires compliance with NASA Software Engineering Requirements (NPR 7150.2B) standard
  - Project documentation
    - Approved
      - Software Development Plan
      - Software Requirements Specification
      - Software Design Document
      - Software Test Plan
      - Software Version Description
      - Software User Manual
      - Software Maintenance Plan
  - Test cycles
    - Unit Testing – Completed 10/16
    - Acceptance Testing – Completed 4/17
    - End-to-End Testing – Completed 6/17
  - Technical reviews
    - Software Design Review – Completed 4/16
    - Test Readiness Review – Completed 3/17
    - Acceptance Review – Completed 8/17
- Delivered PRESTO v1.6 to SLS in August 2017

ryan.k.decker@nasa.gov

Forward Work

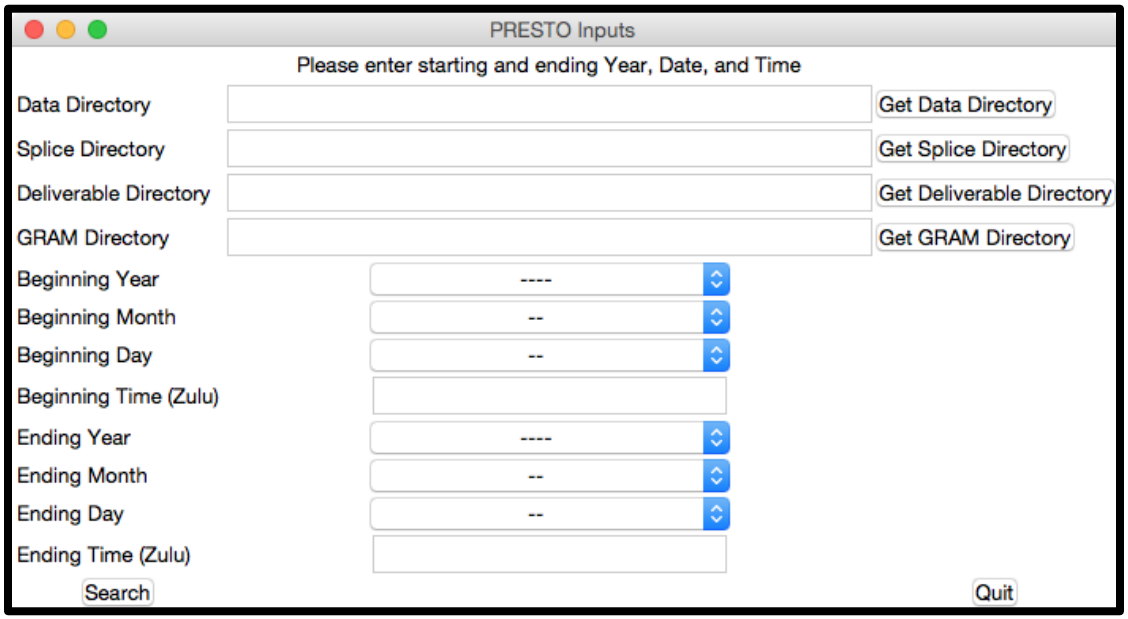
- Update PRESTO TDRWP read routine based on the results of the SLS TDRWP certification results
- Integrated subsystem testing of software in DOLILU process

ryan.k.decker@nasa.gov

BACKUP

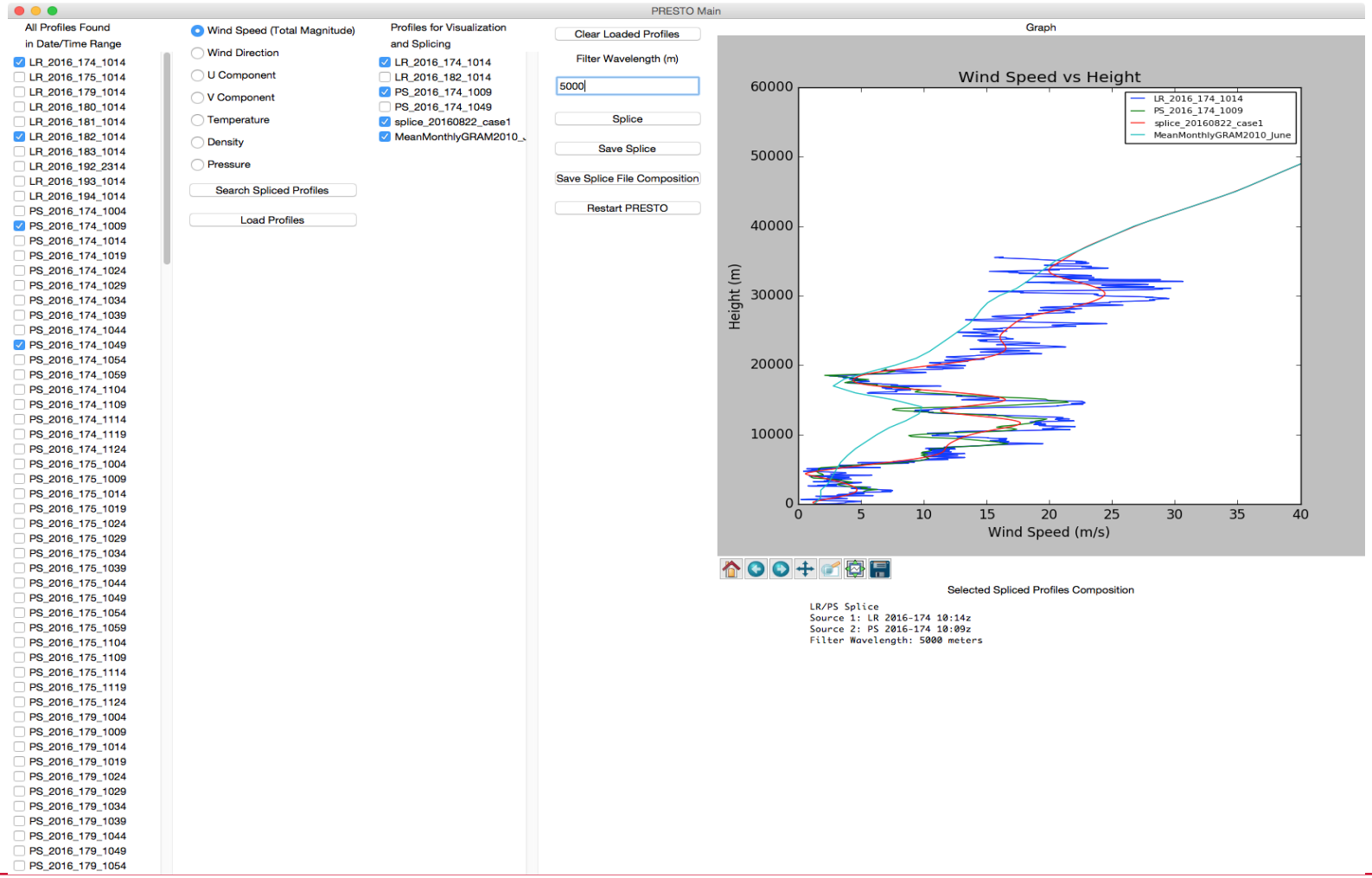
ryan.k.decker@nasa.gov

PRESTO Inputs



ryan.k.decker@nasa.gov

PRESTO Main



ryan.k.decker@nasa.gov

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PRESTO Header Output

```
1  Splice
2  Filter: 300 (meters)
3  mdtf_filenames: LR012151459, PS012301459, RW012301446, RW012301446, RW012301446, RW012301446, RW012301446
4  wind_sources: LR20162151459, RW20162301446_1_QC, PS20162301459, LR20162151459, MeanMonthlyGRAM2010_August
5  wind_splice: (130.0, 300.0), (1950.0, 4530.0), (18430.0, 19430.0), (31550.0, 33550.0) (meters)
6  thermo_sources: LR20162151459, MeanMonthlyGRAM2010_August
7  thermo_splice: (31550.0, 33550.0) (meters)
8  units: (m), (kg/m3), (N/m2), (K), (m/s), (m/s)
9  wind_atm_table
10 0
11 6101 6
12 Alt         rho         P           T          U          V
13 0.00        1.1466e+00  1.0194e+05  306.05     -0.19      3.05
```

Line

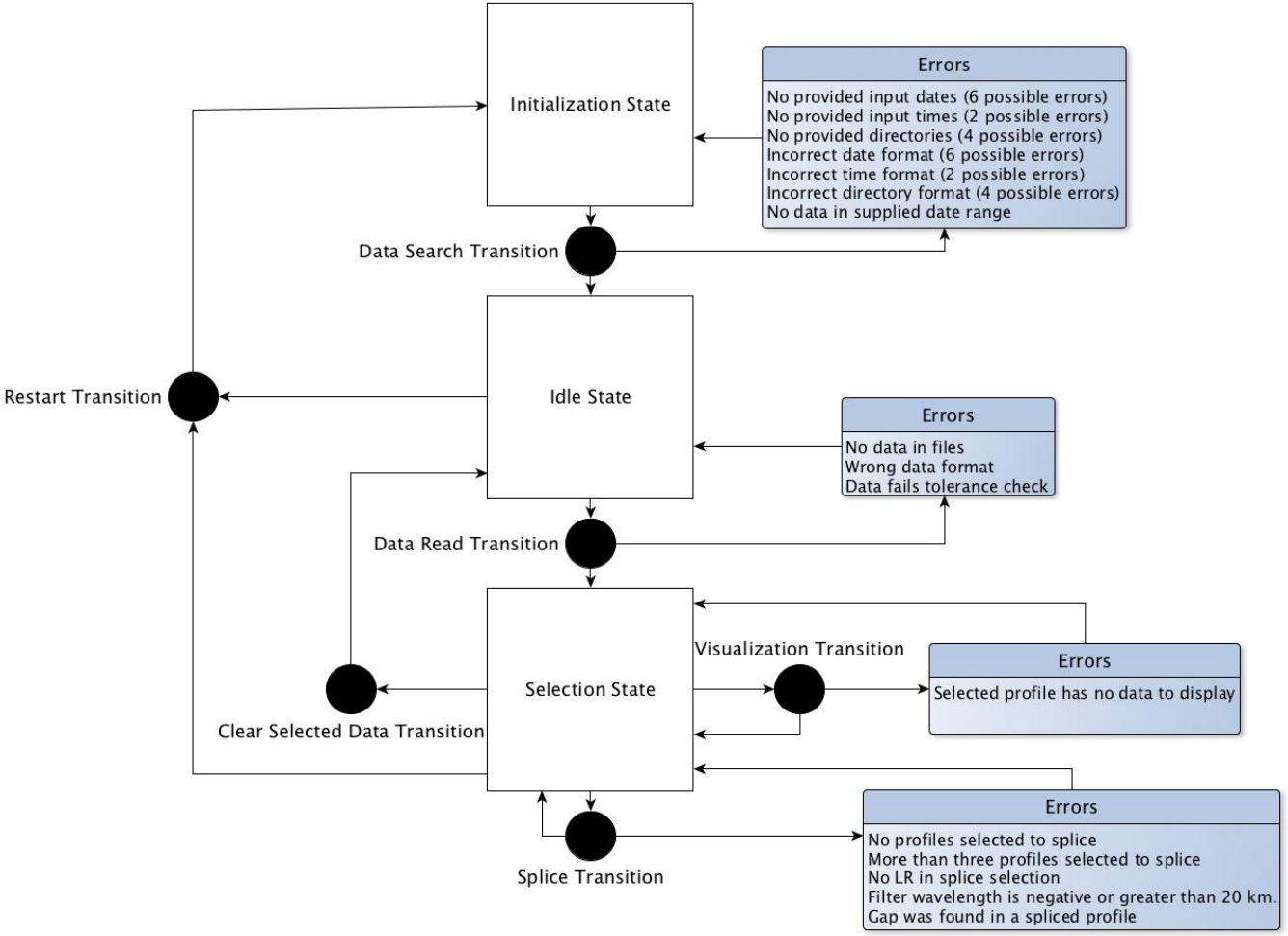
1. Splice – lets the user know it's a splice file
2. Filter: - displays the filter wavelength
3. mdtf_filenames: - the MDTF filenames of the input data (not including GRAM)
4. wind_sources: - the source and release time (and Radar site and QC info) of all inputs in the spliced order
5. wind_splice: - the wind splice altitudes
6. thermo_sources: - the thermodynamic sources (LR and GRAM only)
7. thermo_splice: - the thermo splice altitude
8. units: - the units of the data in the file

9-12. Content for software reading PRESTO data

13-6101. PRESTO data

ryan.k.decker@nasa.gov

PRESTO State Diagram



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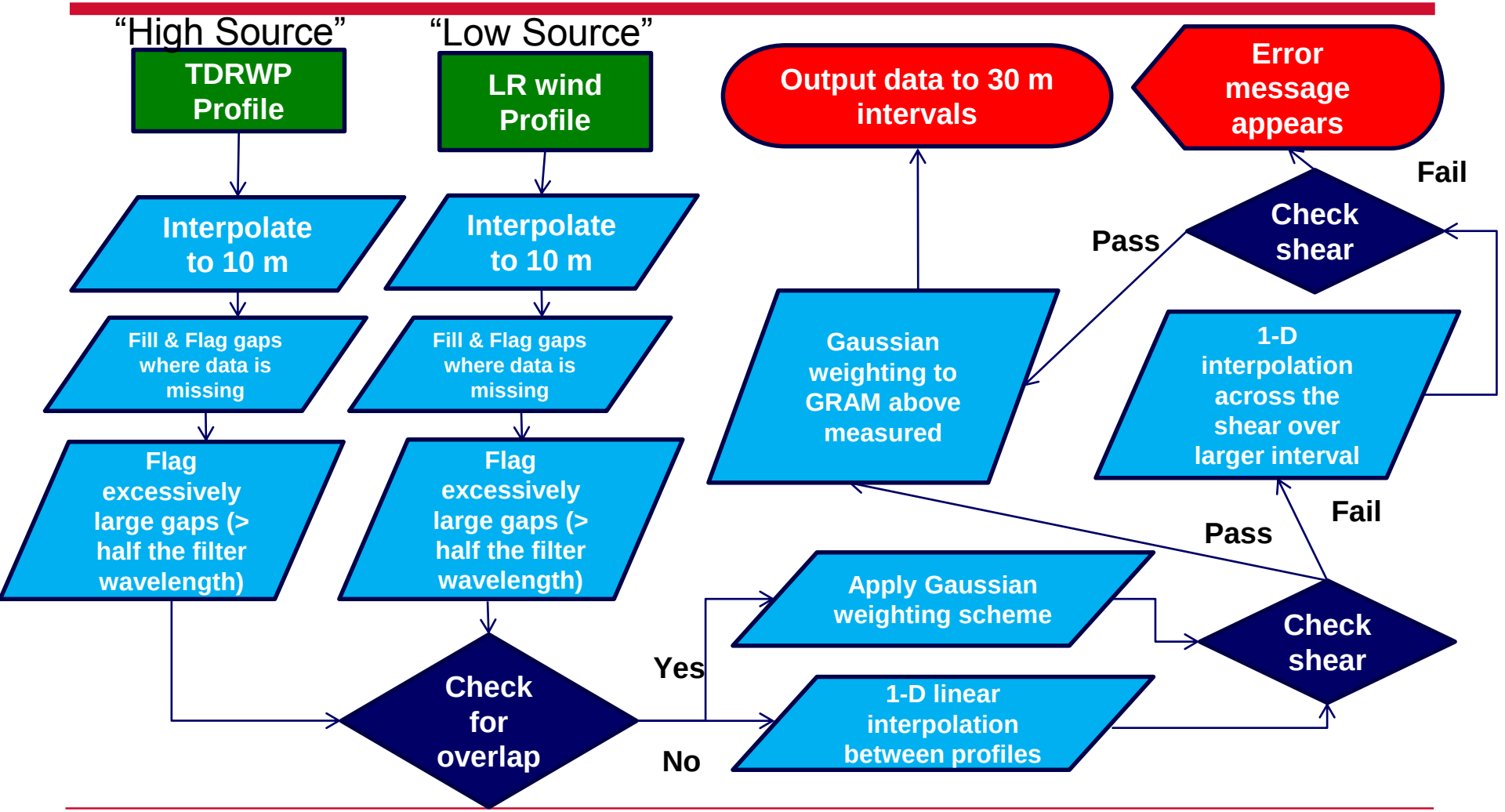
PRESTO Splicing Flowchart



Modified from Barbré, Jr., R. E., "Characteristics of the Spliced KSC Doppler Radar Wind Profiler Database", Presentation to the Natural Environments Day-of-Launch Working Group, 14 August 2013.

ryan.k.decker@nasa.gov